

DATA SHEET



NEC's NPN SILICON TRANSISTOR

NE685M33

FEATURES

- **LOW NOISE:**
NF = 1.5 dB TYP. @ $V_{CE} = 3\text{ V}$, $I_c = 3\text{ mA}$, $f = 2\text{ GHz}$
- **INSERTION POWER GAIN:**
 $IS_{21e}^2 = 11\text{ dB TYP.}$ @ $V_{CE} = 3\text{ V}$, $I_c = 10\text{ mA}$, $f = 2\text{ GHz}$
- **3-PIN SUPER LEAD-LESS MINIMOLD (M33) PACKAGE**

ORDERING INFORMATION

PART NUMBER	QUANTITY	SUPPLYING FORM
NE685M33-A	50 pcs (Non reel)	• 8 mm wide embossed taping
NE685M33-T3-A	10 kpcs/reel	• Pin 2 (Base) face the perforation side of the tape

Remark To order evaluation samples, contact your nearby sales office.
The unit sample quantity is 50 pcs.

ABSOLUTE MAXIMUM RATINGS ($T_A = +25^\circ\text{C}$)

PARAMETER	SYMBOL	RATINGS	UNIT
Collector to Base Voltage	V_{CBO}	9.0	V
Collector to Emitter Voltage	V_{CEO}	6.0	V
Emitter to Base Voltage	V_{EBO}	2.0	V
Collector Current	I_c	30	mA
Total Power Dissipation	P_{tot}^{Note}	130	mW
Junction Temperature	T_j	150	$^\circ\text{C}$
Storage Temperature	T_{stg}	-65 to +150	$^\circ\text{C}$

Note Mounted on $1.08\text{ cm}^2 \times 1.0\text{ mm (t)}$ glass epoxy PCB

Caution Observe precautions when handling because these devices are sensitive to electrostatic discharge.

ELECTRICAL CHARACTERISTICS ($T_A = +25^\circ\text{C}$)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
DC Characteristics						
Collector Cut-off Current	I_{CBO}	$V_{CB} = 5\text{ V}, I_E = 0\text{ mA}$	–	–	100	nA
Emitter Cut-off Current	I_{EBO}	$V_{EB} = 1\text{ V}, I_C = 0\text{ mA}$	–	–	100	nA
DC Current Gain	h_{FE} ^{Note 1}	$V_{CE} = 3\text{ V}, I_C = 10\text{ mA}$	75	110	150	–
RF Characteristics						
Gain Bandwidth Product	f_T	$V_{CE} = 3\text{ V}, I_C = 10\text{ mA}, f = 2\text{ GHz}$	10	12	–	GHz
Insertion Power Gain	$ S_{21e} ^2$	$V_{CE} = 3\text{ V}, I_C = 10\text{ mA}, f = 2\text{ GHz}$	7	11	–	dB
Noise Figure	NF	$V_{CE} = 3\text{ V}, I_C = 3\text{ mA}, f = 2\text{ GHz},$ $Z_S = Z_{opt}$	–	1.5	2.5	dB
Reverse Transfer Capacitance	C_{re} ^{Note 2}	$V_{CB} = 3\text{ V}, I_C = 0\text{ mA}, f = 1\text{ MHz}$	–	0.4	0.7	pF

Notes 1. Pulse measurement: $PW \leq 350\ \mu\text{s}$, Duty Cycle $\leq 2\%$

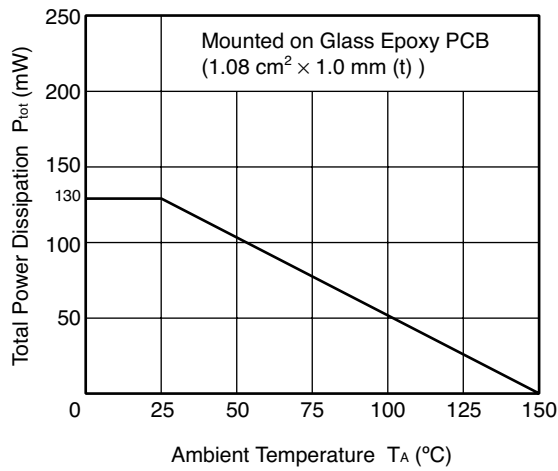
2. Collector to base capacitance when the emitter grounded

hFE CLASSIFICATION

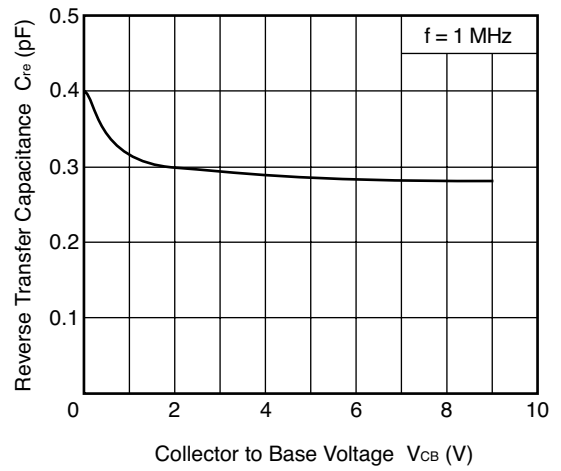
RANK	FB
Marking	Y2
h_{FE} Value	75 to 150

TYPICAL CHARACTERISTICS ($T_A = +25^\circ\text{C}$, unless otherwise specified)

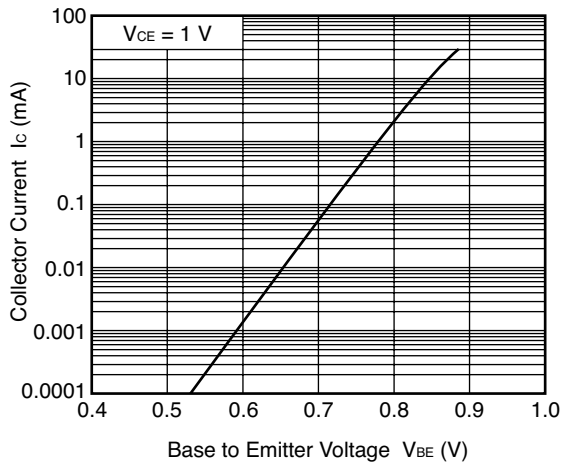
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



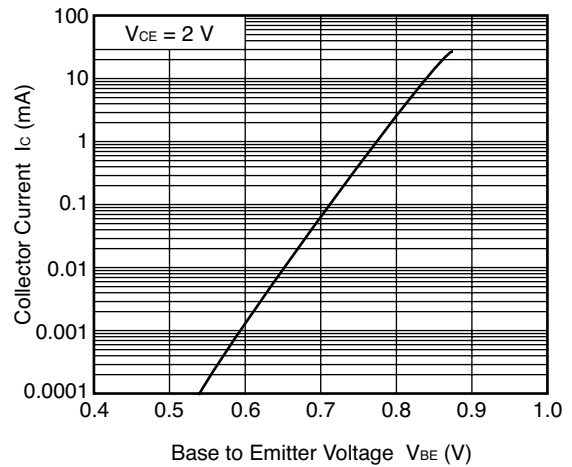
REVERSE TRANSFER CAPACITANCE vs. COLLECTOR TO BASE VOLTAGE



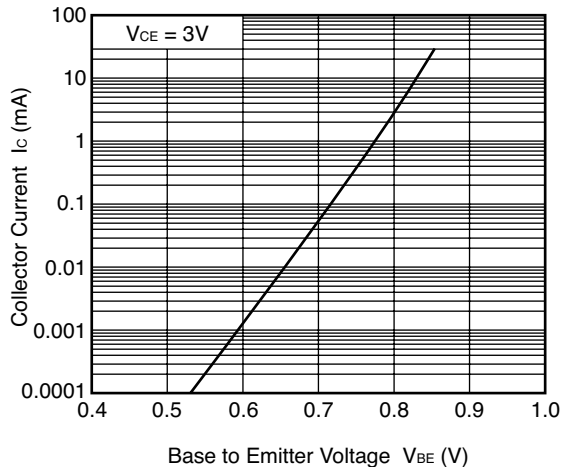
COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE



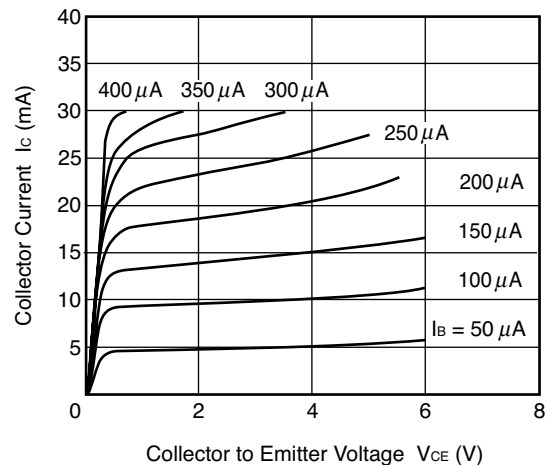
COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE



COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE



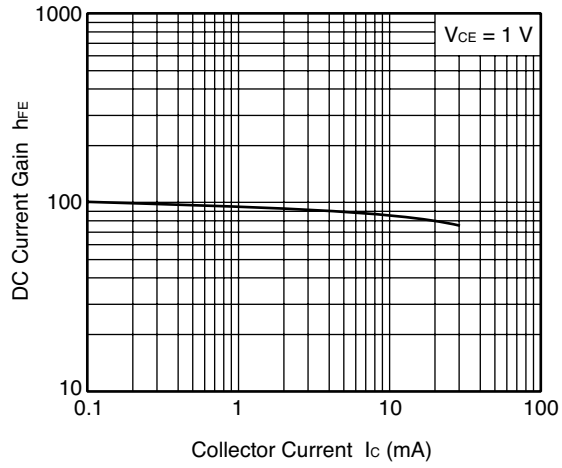
COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE



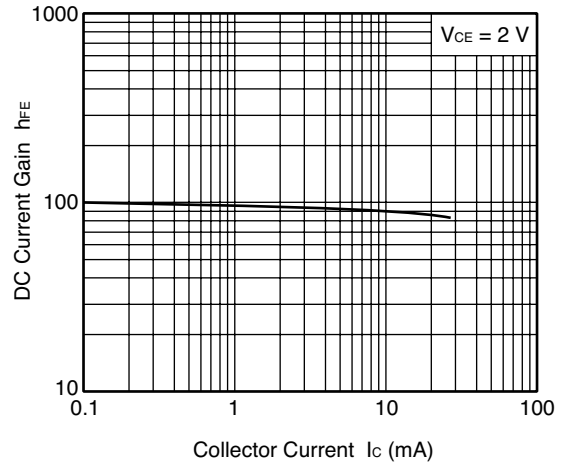
Remark The graphs indicate nominal characteristics.

TYPICAL CHARACTERISTICS ($T_A = +25^\circ\text{C}$, unless otherwise specified)

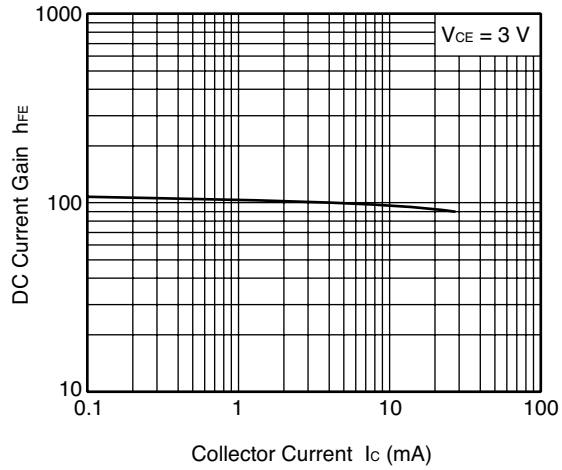
DC CURRENT GAIN vs.
COLLECTOR CURRENT



DC CURRENT GAIN vs.
COLLECTOR CURRENT



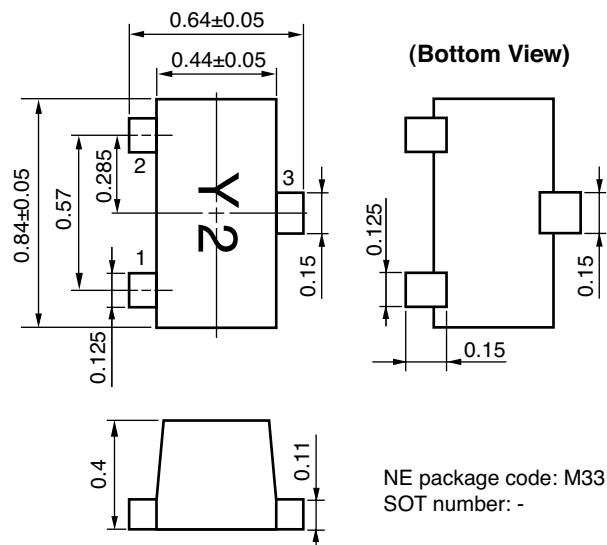
DC CURRENT GAIN vs.
COLLECTOR CURRENT



Remark The graphs indicate nominal characteristics.

PACKAGE DIMENSIONS

3-PIN SUPER LEAD-LESS MINIMOLD (M33) (UNIT: mm)



PIN CONNECTIONS

1. Emitter
2. Base
3. Collector

Life Support Applications

These NEC products are not intended for use in life support devices, appliances, or systems where the malfunction of these products can reasonably be expected to result in personal injury. The customers of CEL using or selling these products for use in such applications do so at their own risk and agree to fully indemnify CEL for all damages resulting from such improper use or sale.

CEL California Eastern Laboratories, Your source for NEC RF, Microwave, Optoelectronic, and Fiber Optic Semiconductor Devices.
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DATA SUBJECT TO CHANGE WITHOUT NOTICE

06/22/2004

Subject: Compliance with EU Directives

CEL certifies, to its knowledge, that semiconductor and laser products detailed below are compliant with the requirements of European Union (EU) Directive 2002/95/EC Restriction on Use of Hazardous Substances in electrical and electronic equipment (RoHS) and the requirements of EU Directive 2003/11/EC Restriction on Penta and Octa BDE.

CEL Pb-free products have the same base part number with a suffix added. The suffix –A indicates that the device is Pb-free. The –AZ suffix is used to designate devices containing Pb which are exempted from the requirement of RoHS directive (*). In all cases the devices have Pb-free terminals. All devices with these suffixes meet the requirements of the RoHS directive.

This status is based on CEL’s understanding of the EU Directives and knowledge of the materials that go into its products as of the date of disclosure of this information.

Restricted Substance per RoHS	Concentration Limit per RoHS (values are not yet fixed)	Concentration contained in CEL devices	
		-A	-AZ
Lead (Pb)	< 1000 PPM	Not Detected	(*)
Mercury	< 1000 PPM	Not Detected	
Cadmium	< 100 PPM	Not Detected	
Hexavalent Chromium	< 1000 PPM	Not Detected	
PBB	< 1000 PPM	Not Detected	
PBDE	< 1000 PPM	Not Detected	

If you should have any additional questions regarding our devices and compliance to environmental standards, please do not hesitate to contact your local representative.

Important Information and Disclaimer: Information provided by CEL on its website or in other communications concerning the substance content of its products represents knowledge and belief as of the date that it is provided. CEL bases its knowledge and belief on information provided by third parties and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. CEL has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. CEL and CEL suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall CEL’s liability arising out of such information exceed the total purchase price of the CEL part(s) at issue sold by CEL to customer on an annual basis.

See CEL Terms and Conditions for additional clarification of warranties and liability.